

**REMARKS**

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The present invention as set forth in **amended Claim 17** relates to a method for reforming hydrocarbon, comprising **contacting the hydrocarbon and carbon dioxide gas with a catalyst,**

wherein

the **catalyst comprises** ruthenium supported on a **zirconia carrier** and an amount of ruthenium supported on the carrier is from 0.05 to 20 wt.% based on the entirety of the catalyst; and

a ratio of feedstock hydrocarbons to carbon dioxide is from 0.1 to 3 in terms of the number of carbon dioxide molecules/the number of carbon atoms in the hydrocarbons.

**Amended Claim 18** relates to a method for reforming hydrocarbon, comprising **contacting the hydrocarbon and carbon dioxide gas with a catalyst comprising zirconium and ruthenium supported on an inorganic oxide carrier,**

wherein

the catalyst comprises an amount of zirconium supported on the carrier of from 0.05 to 20 wt.% zirconium as reduced to  $ZrO_2$  based on the entirety of the catalyst; and

a ratio of feedstock hydrocarbons to carbon dioxide is from 0.1 to 3 in terms of the number of carbon dioxide molecules/the number of carbon atoms in the hydrocarbons.

In contrast, Tomohiro et al and JP 09-029097 fail to disclose or suggest the specific catalysts used in Claims 17 and 18, specifically, the zirconia carrier of Claim 17 and the combination of ruthenium and zirconium as catalyst metals in Claim 18.

Tomohiro et al (JP08-175805, a full translation of which is attached herewith) disclose in Claim 1 a method for producing carbon monoxide and hydrogen. In this method,

methane and carbon dioxide are contacted with a catalyst. The catalyst contains an active metal supported on **an alumina carrier**. In item [0016] of Tomohiro et al, the active metal is described as belonging to group 8 of the Periodic Table. Specifically, nickel, ruthenium, rhodium, iridium, and cobalt are desirable and nickel is desirable from a point of cost.

In contrast, in **Claim 17** of the **present invention**, the ruthenium is supported on a **zirconia carrier**. Even if other components were included, a zirconia carrier still contains mainly zirconia.

In addition, in **Claim 18**, both zirconium and ruthenium are supported on a carrier. Tomohiro et al do not disclose or suggest zirconium (the 4<sup>th</sup> group of Periodic Table) or the combination of zirconium and ruthenium.

Further, JP 09-029097 relates to a **steam reforming reaction** which is different from the autothermal reforming reaction defined in the present invention. The autothermal reforming reaction is further explained in the specification, from page 10, line 2 to page 11, line 3. Even further, the catalysts of this reference use an alumina carrier and not a zirconia carrier as claimed in Claim 17.

Therefore, the rejection of Claims 17-20, 22, 23, 29, 30, 31, 32 and 33 under 35 U.S.C. § 102(b) as anticipated by Tomohiro et al and the rejection of Claims 21, 24 and 27 under 35 U.S.C. § 103(a) over Tomohiro et al in view of JP 09-029097 are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

In addition, the rejection of Claims 10, 12, 13 and 14 under 35 U.S.C. § 103(a) over Yarrington et al in view of JP 09-029097 is respectfully traversed.

**Amended Claims 10 and 12** relate to methods for autothermal reforming. Notably, **Claim 10** uses a catalyst in which **ruthenium is supported on a zirconia carrier**. **Claim 12** uses a catalyst comprising **zirconium and ruthenium on an inorganic oxide support**. In

addition, Claims 10 and 12 require that a ratio of oxygen to the feedstock fed to the reaction system is from **0.2 to 0.8** in terms of the number of oxygen molecules/the number of carbon atoms in the feedstock.

Yarrington et al and JP 09-029097 fail to disclose or suggest a method which uses a catalyst in which **ruthenium is supported on a zirconia carrier** or a catalyst comprising **zirconium and ruthenium on an inorganic oxide support** or a ratio of oxygen to the feedstock fed to the reaction system is from **0.2 to 0.8** in terms of the number of oxygen molecules/the number of carbon atoms in the feedstock.

Yarrington et al disclose a method for autothermal reforming to produce hydrogen or a synthesis gas using a reforming gas, comprising oxygen, carbon dioxide and steam, with a catalyst. Various carriers are disclosed at col. 5, lines 43-50, such as alumina, alumina-silica, alumina-silica-titania, mullite, cordite, zirconia, zirconia-spinel, zirconia-mullite, silicon carbide etc. Catalytic metals are platinum group metals such as platinum, palladium, rhodium, iridium, osmium, and ruthenium (Yarrington et al, col. 6, lines 44 to 47). There is no disclosure or suggestion of the specific combination of a **zirconia (carrier) and ruthenium (catalytic metal)** as claimed in **Claim 10** or of a **combination of zirconium and ruthenium as a catalytic metal** as claimed in **Claim 12**.

Further, JP 09-029097 relates to a **steam reforming reaction** which is different from the autothermal reforming reaction defined in the present invention. The autothermal reforming reaction is further explained in the specification, from page 10, line 2 to page 11, line 3. Even further, the catalysts of this reference use an alumina carrier and not a zirconia carrier as claimed in Claim 10.

Moreover, Claims 10 and 12 require a ratio of oxygen to the feedstock to the reaction system is from 0.2 to 0.8 which is not disclosed or suggested by JP 09-029097.

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Therefore, the rejection of Claims 10, 12, 13 and 14 under 35 U.S.C. § 103(a) over Yarrington et al in view of JP 09-029097 is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

The objection to Claim 19 under 37 C.F.R. § 1.75 (c) is obviated by the amendment of the dependency of this Claim.

The objection to Claims 19, 26 and 30 is obviated by the amendment of these Claims.

The rejection of Claim 15 under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, is obviated by the amendment of this Claim.

Applicants submit that the present application is now in condition for allowance and early notice of such action is earnestly solicited.

Respectfully submitted,

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